APPENDIX A

DATA COLLECTION METHODS

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TABLE

ACRONYMS/ABBREVIATIONS

CLEAN	Comprehensive Long-Term Environmental Action Navy
COC	chain of custody
CTO	contract task order
DO	dissolved oxygen
IDW	investigation-derived waste
NAF	Naval Air Facility
ORP	oxidation-reduction potential
OVM	organic vapor meter
PPE	personal protective equipment
QAPP	quality assurance project plan
QC	quality control
SOP	standard operating procedure
UN	United Nations
U.S. EPA	United States Environmental Protection Agency
VOC	volatile organic compound

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Appendix A
DATA COLLECTION METHODS

Groundwater monitoring field activities were conducted during 2002, 2003, and 2004 at petroleum-only sites at Naval Air Facility (NAF) El Centro. These activities were conducted in accordance with the Work Plan (BNI 2000a), Groundwater Monitoring Plan/Field Sampling Plan (BNI 2000b), Technical Memorandum for Groundwater Sampling (BEI 2002), and the following Comprehensive Long-Term Environmental Action Navy (CLEAN) Program Standard Operating Procedures (SOPs) (BNI 2004):

- SOP 6, Instrument Calibration and Use
- SOP 7, Water and Free Product Level Measurement in Wells
- SOP 8, Groundwater Sampling
- SOP 9, Sample Containers, Preservation, and Handling
- SOP 10, Sample Custody, Transfer, and Shipment
- SOP 11, Decontamination of Equipment
- SOP 17, Logbook Protocols
- SOP 22, Investigation-Derived Waste Management

A1 GROUNDWATER SAMPLING

Groundwater sampling activities conducted during the groundwater monitoring program were monitored and/or performed by CLEAN personnel under the supervision of a California registered geologist or professional engineer. All field data were recorded in field logbooks as outlined in the Quality Assurance Project Plan (QAPP) (BNI 2000a).

A1.1 Well Inspection

Before water levels were measured or groundwater samples were collected, the well's condition was inspected. Signs of vandalism, unauthorized entry, or settlement and/or ponding around the well surface completion were noted in the field logbook. The following well conditions were checked:

- surface seal
- well locks
- casing integrity
- other relevant conditions

A1.2 Water-Level Measurement

Before measuring the water level at each monitoring well, an organic vapor meter (OVM) was used to monitor for potential organic vapors within the well casing. The OVM probe tip was placed at the top of the well casing after the well cap was removed. The reading was recorded on the air monitoring form, and the appropriate safety and health actions were taken as required.

Water-level measurements were taken manually using a two-conductor, battery-powered water-level indicator. The indicator probe was lowered into the casing until an electric signal indicated that water had been reached. The graduated cable was then read from the surveyed reference point on the inside of the top of the well casing. The water-level measurement was compared to the most recent data obtained for the well. If the past and present measurements differed by more than 0.5 foot, the depth to groundwater was remeasured for verification purposes.

Groundwater measurements were taken prior to groundwater sampling. Water-level measurements were taken as quickly as possible to reduce effects of diurnal water-level changes. Water-level measurement data were obtained following the procedures outlined in SOP 7.

A1.3 Well Purging and Sample Collection

Groundwater samples were collected in accordance with SOP 8. Monitoring wells were purged using the MicroPurge sampling method to assure that representative formation water was retrieved. A 1.5-inch-diameter portable bladder pump, which uses disposable bladders, was used to purge and sample wells that did not have dedicated pumps installed. The water level in the well was monitored continuously throughout purging. A programmable pump controller connected to a portable air compressor unit was used to control the pumping rate. The pump inlet was placed within the well screen interval, and a pumping rate of between 100 and 500 milliliters per minute was maintained during purging. Field monitoring parameters (pH, conductivity, dissolved oxygen [DO], turbidity, and oxidation-reduction potential [ORP]) were measured at 5-minute intervals and recorded on the well sampling record.

Purging continued until measurements were stable for three consecutive readings. Stability was based on the following criteria:

- temperature ± 0.1 degree Celsius
- pH ± 0.1
- conductivity ± 3 percent
- ORP ± 10 millivolts
- turbidity and DO ± 10 percent

Groundwater samples were collected directly from the pump discharge tube after the monitoring parameters had stabilized. Sampling equipment was handled with clean surgical gloves to limit potential cross-contamination. Samples for analyses of volatile organic compounds (VOCs) were collected first, followed by samples for analyses of other organic parameters. Sample containers submitted for chemical analyses were capped with Teflon-lined plastic lids, labeled, sealed in zip-lock bags, and placed with ice in an insulated cooler for shipment under chain-of-custody (COC) procedures to the laboratory.

A2 QUALITY CONTROL SAMPLES

A field program conforming to procedures outlined in the QAPP (BNI 2000a) was implemented to help maintain the required level of confidence in the field data and to provide cross-checking on the laboratory contracted to perform the analyses.

The following types of field quality control (QC) samples were submitted for analysis:

- trip blanks
- field rinsate blanks
- source water blanks
- field duplicates

Trip blanks were submitted with each set of samples for analyses of VOCs. Trip blanks were prepared by the laboratory using the same type of container, from the same batch of containers, as that used to store the samples. The trip blank consisted of distilled water of known quality with the same preservative used for the samples. The trip blank was carried to the field and returned to the laboratory with the samples without being opened.

Field rinsate blanks were prepared by the field crew each day the nondedicated sampling equipment was used. Field rinsate blanks were prepared at the site by passing distilled water of known quality over decontaminated water-sampling equipment. The field log identifies the team members, date, and equipment. This identification procedure associated field rinsate blanks with a specific team's field decontamination procedure at a site on any day. The rinsate blanks were submitted for the same analyses as site samples.

A source water blank was prepared by the field crew for each source of distilled water used for equipment decontamination during a sampling round. The source blank is used to assess the potential for sample contamination from the final rinsewater of the decontamination process. The blank is analyzed for all the parameters being collected at wells sampled with a portable bladder pump.

Field duplicate samples were prepared for one out of every ten groundwater samples collected. The duplicates were sent to the laboratory and analyzed for the same parameters as the site samples. Duplicate samples were submitted "blind" along with all other samples; the laboratory staff did not know which samples were duplicates.

In addition to blind duplicates, a triple-volume groundwater sample (i.e., matrix spike and matrix spike duplicates) was collected for laboratory QC analysis. At least 1 triple-volume groundwater sample was collected for every 20 groundwater samples sent to the laboratory, and was analyzed for the parameters designated for the monitoring well. Laboratory QC samples were identified as such on the label and on the COC form.

A3 SAMPLE HANDLING

Sample handling consisted of labeling, packaging, and shipping samples to the laboratory. These activities were performed in accordance with SOPs 9 and 10, which

describe the protocols for assuring the integrity of the samples from the time of collection to analysis.

A3.1 Sample Containers and Preservation

Sample containers were provided by the selected analytical laboratory (Table A-1). For samples that required a preservative, the laboratory supplied containers with sufficient amounts of preservative to alter the pH of the water to the correct value, as specified in the QAPP (BNI 2000a). Groundwater samples were placed in a cooler and kept at approximately 4 degrees Celsius from the time of sample collection until analysis by the laboratory. Additionally, empty sample containers were kept out of direct sunlight in a cool place prior to sampling.

A3.2 Sample Packaging and Shipment

Samples shipped to the laboratory were accompanied by the appropriate sample transfer and shipment paperwork as described in SOP 10. COC forms and custody seals were used to document possession and help prevent tampering of samples during shipment to the laboratory. The field investigation crews prepared all samples for shipment to the laboratory as follows:

1. attached sample label to each sample container
2. placed custody seals on sample container
3. wrapped all glass containers in foam sheet or bubble wrap and sealed them in zip-lock bags
4. packed cooler with ice and double bagged it to prevent leakage during shipment
5. placed the completed COC forms in a plastic zip-lock bag and taped it inside the cooler lid
6. secured cooler with custody seals

Samples were shipped by commercial overnight carrier. The method of shipment, courier name, and other pertinent information were entered on the COC forms.

A4 SAMPLE DOCUMENTATION

This section describes the use of all paperwork, including field logbooks, record logs, sample paperwork, COC forms, and custody seals.

Table A-1
Sample Containers, Preservatives, and Holding Times

Analyte	Container	Preservative	Holding Time
volatile organic compounds	Three 40-mL glass vials	Cool to 4 °C, HCl to pH < 2	14 days
TPH as gasoline	Two 40-mL glass vials	Cool to 4 °C, HCl to pH < 2	14 days
TPH as diesel	Two 1-liter amber glass bottles	Cool to 4 °C	7/40 days*

Note:
* 7 days to extract, 40 days to analyze

Acronyms/Abbreviations:
°C – degrees Celsius
HCl – hydrochloric acid
mL – milliliter
TPH – total petroleum hydrocarbons

A4.1 Field Logbook

A controlled, bound field logbook was maintained by the senior representative. The field logbook was used to record details such as weather conditions, COC, well locations, sampling events, depth to groundwater, presence or absence of floating product, field water quality parameters, purge rate, volume of purged groundwater, and samples being collected. All entries were made using waterproof ink and signed and dated. An error made in the field logbook was corrected by drawing a line through the error and writing the correct information. The correction was initialed and dated. The field logbook was kept as a permanent record of sampling activities. The completed logbook has now become part of the permanent project record.

A4.2 Documents and Chain of Custody

Sample identification documents were prepared so that sample identification and COC were maintained and sample disposition was controlled. Sample documents were completed with waterproof ink.

Official custody of samples was maintained and documented from the time of sample collection until the validation of analytical results. The COC record is the document that records the transfer of sample custody.

Once samples were received at the laboratory, it was the responsibility of laboratory personnel to acknowledge receipt of samples, record the temperature within the shipping cooler, and verify that the containers had not been opened or damaged. It was also the responsibility of laboratory personnel to maintain custody and sample tracking records throughout sample preparation and analysis. A copy of the COC record was sent to the CLEAN Program office at the completion of analytical work.

A4.3 Sample Labels

A label was affixed to every sample container and included the following:

- project number
- sampling location
- CLEAN sample number
- collector's initials (not preprinted)
- collection date and time
- type of preservations for each analysis
- analyses to be performed
- special instructions

Detailed sample custody, transfer, and shipment procedures are provided by SOP 10.

A4.4 Station Identification

Groundwater monitoring wells at NAF El Centro are identified by the site number followed by the well number. For example, "539-MW2" indicates the second well installed at NAF El Centro, Underground Storage Tank Site 539.

A4.5 Analytical Sample Identification

Each groundwater sample collected for laboratory analysis was assigned a unique ten-character identifier, which was different from the sample location identification to allow input directly into the database. The analytical samples were identified according to the following convention:

C043G101 01

where

C043 = the contract task order number for the comprehensive groundwater monitoring program
G101 = a unique sequential sample number (G = groundwater, T = trip blank, R = equipment rinsate, B = source water blank)
01 = laboratory container number specific for each analysis

A5 DECONTAMINATION AND DISPOSAL OF INVESTIGATION-DERIVED WASTE

Nondedicated sampling equipment was decontaminated between sampling locations in accordance with SOP 11. Disposable sampling equipment (e.g., surgical gloves, laboratory-provided sample containers, and disposable groundwater sampling equipment) was used once and then placed with used personal protective equipment (PPE) for disposal.

Decontamination of nondedicated sampling equipment (e.g., portable pumps and measurement equipment) is performed by:

1. washing with a nonphosphate detergent,
2. rinsing with potable water,
3. rinsing with deionized water, and
4. air drying.

Equipment that was not used immediately after decontamination was stored in new plastic bags. Decontamination rinsate was contained and transferred to drums or other applicable storage containers.

The following types of investigation-derived waste (IDW) may be generated from the groundwater sampling field activities:

- decontamination water from sampling equipment
- used PPE

- disposable sampling equipment
- samples submitted for laboratory analyses (with suitable disposition of the excess sample materials provided by the laboratory)
- purgewater from groundwater monitoring wells

All IDW is disposed in accordance with SOP 22.

Liquid IDW is stored separately in United Nations (UN)-approved 55-gallon drums. Contaminated PPE and sampling equipment is placed in covered UN-approved 55-gallon drums. Noncontaminated PPE and sampling equipment is placed in 33-gallon plastic trash bags and disposed in industrial waste bins.

The waste disposal subcontractor disposes the IDW within 90 days of collection. Drummed liquid IDW is transported to Installation Restoration Program Site 7 and disposed through the groundwater treatment system operating at that site.

A6 LABORATORY ANALYSES

Groundwater samples were sent off-site to the Agriculture and Priority Pollutant Laboratory in Fresno, California. Samples were analyzed using the following methods:

- United States Environmental Protection Agency (U.S. EPA) Method 8260B for VOCs
- U.S. EPA Method 8015-M for total petroleum hydrocarbons as diesel and gasoline

A7 DATA VALIDATION

Laboratory results were subjected to a third-party validation in accordance with the CLEAN Technical Specification for Data Validation (BNI 1998). Laboratory data validation requirements are described in Southwest Division Naval Facilities Engineering Command (2001) and U.S. EPA (1994a,b) guidance documents. Laboratory Data Consultants in Carlsbad, California, performed the validation as detailed in Section 4 of the main report.

Copies of data validation reports are provided in Appendix E. The reports contain frequent use of the phrase, "No Sample Data Qualified in this SDG [sample delivery group]." This phrase indicates that the data were validated and that no qualifiers were necessary because all acceptance criteria were met.

Qualifiers were assigned to the data on the basis of review findings. The following qualifiers were applied as appropriate.

- U – The analyte was not reported above the detection limit. The associated numerical value is the detection limit.
- J – The associated numerical value is an estimated quantity.
- UJ – The analyte was not reported above the detection limit. The sample quantitation limit is an estimated quantity.

- N – There is presumptive evidence the analyte is present.
- NJ – There is presumptive evidence the analyte is present at an estimated quantity.
- R – The result is unusable.

Review qualifiers are presented along with results in tables of analytical data included in this report.

Data were generally found to be acceptable with respect to accuracy, precision, completeness, and comparability criteria. A detailed discussion of data usability is in Section 4 of the main report.

A8 REFERENCES

Bechtel Environmental, Inc. 2002. Technical Memorandum for Groundwater Sampling at Installation Restoration Sites 1, 2, 7, and 10 and Various Petroleum Sites, Naval Air Facility El Centro, California. September.

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